TECHNICAL REVIEWERS' RATING SUMMARY

R004-C

Renewable Oil Refinery Development for Commercialization

Energy & Environmental Research Center
Principal Investigators: Chad A. Wocken
Request for $500,000; Total Project Costs $1,000,000

Rating Category	Weighting Factor	Technical Reviewer 3A Rating	3B Rating	3C Rating	Average Weighted Score
1. Objectives	9	5	5	4	42.00
2. Achievability	9	3	5	3	33.00
3. Methodology	7	4	4	4	28.00
4. Contribution	7	5	4	5	32.67
5. Awareness	5	3	1	2	10.00
6. Background	5	3	4	5	20.00
7. Project Management	2	3	3	3	6.00
8. Equipment Purchase	2	2	5	5	8.00
9. Facilities	2	4	5	3	8.00
10. Budget	2	4	4	3	7.33
Average Weighted Score		191	205	189	**195.00**
Maximum Weighted Score					**250.00**

OVERALL RECOMMENDATION

FUND			
FUNDING MAY BE CONSIDERED	x	x	x
DO NOT FUND			

R004-C
Renewable Oil Refinery Development for Commercialization
Submitted by Energy & Environmental Research Center
Principal Investigators: Chad A. Wocken
Request for $500,000; Total Project Costs $1,000,000

1. The objectives or goals of the proposed project with respect to clarity and consistency with North Dakota Industrial Commission/Renewable Energy Council goals are: 1 – very unclear; 2 – unclear; 3 – clear; 4 – very clear; or 5 – exceptionally clear.

Reviewer 3A (Rating: 5)
The objective has been clearly stated and consistent with goals of NDIC/REC.

Reviewer 3B (Rating: 5)
The objectives are exceptionally clear and I believe them to be consistent with ND Industrial Commission/Renewable Energy Council. Technology and economic assessments of new technologies are critical to successfully commercializing any new technology. Pilot plant demonstrations of new technologies are critical to commercial evaluation, debugging and/or enhancement, and de-risking. Industry will not likely adopt new technologies without going through a pilot plant phase and a large part of this proposal is to develop a design for such a pilot plant.

I am scoring this proposal on quite a lot of "blind trust" because the amount of intellectual property (IP) involved is very unclear. While there is a list of IP in the proposal, only two seem to be actual patent filings. I am very confused and perhaps suspicious because there was no short description or technical summary of the IP. The investigators are asking us to trust that they have technological advancements worthy of testing at the pilot plant scale and I guess I am inclined to do that.

Reviewer 3C (Rating:4)
- Details of optimization objectives and factors to be considered not clear.
- Biddable design for renewable oil refinery and economic analysis very clear.

2. With the approach suggested and time and budget available, the objectives are: 1 – not achievable; 2 – possibly achievable; 3 – likely achievable; 4 – most likely achievable; or 5 – certainly achievable.

Reviewer 3A (Rating: 3)
The time line is most likely to be achievable as they seems have technical knowledge. The matching budget which is supposed to come from Center for Biomass Utilization is not yet guaranteed. Delay or Non-funding of that part of resources may delay this project.

Reviewer 3B (Rating: 5)
The approach, timeline and budget are appropriate for the objectives and I believe the objectives are achievable with the proposed approach, timeline and budget.

The approach seems to be sound but there are two potential deficiencies.

The first weakness is that there is no disclosure of the technology to be used to convert vegetable oil to fuel. I presume this is proprietary but some crude explanation about the process technology is needed for full evaluation.

The second weakness is an absence of a working hypothesis and/or evidence that crambe oil offers any advantage in making the proposed fuel. It is certainly true that crambe oil is unique it that it contains nearly 60 % erucic acid (C22:1), which is different from normal edible oils rich in C18 fatty acids, but there is no evidence offered about why this should be advantageous. Very little crambe is produced today in the U.S. and should command premium prices over other vegetable oils. Soybean oil will likely remain the lowest cost vegetable oil. No cost analysis is provided to show crambe conversion would be cost effective. A "back of the envelope" estimate using data known at this time would be helpful even though a more detailed economic analysis is an objective of the proposed work. We really need a crude estimate that the investigators should be able to provide.

There seems to be modest industry interest. I would expect there to be cost chare from the industry partner Tesoro Mandan but no details are provided or even a description of who Tesoro Mandan is. I found them on the web and they seem to be a significant company. How they are going to be involved is not at all clear and to what level are they committed to the project. The letter from 3M is not particularly strong and they are not providing cost share.

Reviewer 3C (Rating: 3)
- Difficult to assess task 1 given that details of this task were quite spars.
- I would expect those details would also impact tasks 2 and 3 but explanation of this relationship has also not been made clearly.

3. The quality of the methodology displayed in the proposal is: 1 – well below average; 2 – below average; 3 – average; 4 – above average; or 5 – well above average.

Reviewer 3A (Rating: 4)
The methodologies are well stated. The participation of private company is stated. Though they mentioned about the development of a design package, the details of the design package is not discussed.

Reviewer 3B (Rating: 4)
The methodologies to carry out the three key tasks proposed project are largely reasonable. I have already pointed out my concern about the use of crambe oil and lack of understanding why they think it offers advantages. It is not clear what 3M will really do and I am baffled as to why

they failed to put a value of in-kind support to carry out that work. Are they really going to do something??

Reviewer 3C (Rating: 4)

- Task 1 is somewhat vague. The authors discuss tailoring and or optimizing a process with no discussion of the objectives of the optimization or the variables that will be altered in that optimization process. Apparently much has already been done to accomplish this task but specifics on what has been done and what remains to be done are not included.
- It is stated that prior to the 2009 growing season, crambe oil processing will be optimized, the product will be sent out for testing and then CREC will develop a strategy to regenerate the crambe industry in the state and implement that plan – this seems overly ambitious if not impossible.

4. The scientific and/or technical contribution of the proposed work to specifically address North Dakota Industrial Commission/Renewable Energy Council goals will likely be: 1 – extremely small; 2 – small; 3 – significant; 4 – very significant; or 5 – extremely significant.

Reviewer 3A (Rating: 5)
The proposed project is aimed to use North Dakota-cultivable feedstocks to produce fuel and the state has tremendous potential of supplying feedstocks to the proposed renewable oil refinery. This refinery would create jobs and would enhance the economic development of the state.

Reviewer 3B (Rating: 4)
Long term, the scientific and/or technical contributions could be quite good, if not excellent. The proposed work is applied engineering along with enhancing research infrastructure so additional industry-relevant research can be undertaken.

Reviewer 3C (Rating: 5)

- Pilot Plant development would be a strong step in developing a large scale biorefinery in ND.

5. The principal investigator's awareness of current research activity and published literature as evidenced by literature referenced and its interpretation and by the reference to unpublished research related to the proposal is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 3A (Rating: 3)
The principal investigator has claimed to be working in this field through EERC. But there are no published reference made in this claim. They provided information about EERC and informed about a publication in July 2005 issue of Journal of the Air & Waste Management Association. But none of the proposed collaborators are co-author of the paper.

Reviewer 3B (Rating: 1)
There is almost no information provided to be able to evaluate this criteria. No scientific review of published literature is provided at all. The technology on which the pilot plant is to be developed and any intellectual property is not even disclosed.

Reviewer 3C (Rating: 2)
- Proposal lacked depth in this regard.
- No recognition of other work done; no literature cited; no reference of what hurdles remain in development.
- PIs *likely* have such knowledge/background but it was not shown or described in the proposal as specifically asked for above.

6. The background of the investigator(s) as related to the proposed work is: 1 – very limited; 2 – limited; 3 – adequate; 4 – better than average; or 5 – exceptional.

Reviewer 3A (Rating: 3)
The background of the investigators seems to be adequate as evident from their brief description of their background. But their experience in this field has not been explained clearly.

Reviewer 3B (Rating: 4)
Limited information on research credentials of the investigators is provided, one cannot really tell how productive and competent they are. UniField Engineering seems to be highly qualified to undertake the proposed subcontract.

Reviewer 3C (Rating: 5)
- Strong background; experience and patents

7. The project management plan, including a well-defined milestone chart, schedule, financial plan, and plan for communications among the investigators and subcontractors, if any, is: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – very good; or 5 – exceptionally good.

Reviewer 3A (Rating: 3)
Execution of the project timeline has been clearly mentioned. The financial plan has not been so clear. There is not much communication with the subcontractor.

Reviewer 3B (Rating: 3)
The management plan seems to be adequate. I still have concerns about the absence of industry cost share. I believe there may be some but it is not disclosed or quantified. The lead person at Tesoro was not identified.

Reviewer 3C (Rating: 3)
- Milestone chart – acceptable
- No communication plan described

- Only discernable management plan was a "proven track record"
- Financial Plan/budget laid out well.

8. The proposed purchase of equipment is: 1 – extremely poorly justified; 2 – poorly justified; 3 – justified; 4 – well justified; or 5 – extremely well justified. (Circle 5 if no equipment is to be purchased.)

Reviewer 3A (Rating: 2)
The justification for purchasing equipment has not been clearly justified. It seems, equipments would be procured by the sub-contractor, whose budget has not been clearly defined.

Reviewer 3B (Rating: 5)
As best I can tell no equipment is proposed to be purchased. None should be needed to accomplish the proposed work plan.

Reviewer 3C (Rating: 5)
- (No equipment to be purchased)

9. The facilities and equipment available and to be purchased for the proposed research are: 1 – very inadequate; 2 – inadequate; 3 – adequate; 4 – notably good; or 5 – exceptionally good.

Reviewer 3A (Rating: 4)
EERC's facilities seem to be notably good. Equipment purchase is not mentioned in the budget. It seems the equipments would be purchased by UniField Engineering, the subcontractor.

Reviewer 3B (Rating: 5)
No unusual facilities are required to undertake the proposed work. Office space is all that is required and I have assumed that is available.

Reviewer 3C (Rating: 3)
- Described very briefly
- Reviewers seem to be expected to believe they have the necessary facilities without them having to describe in greater detail as would be expected of other applicants.

10. The proposed budget "value"[1] relative to the outlined work and the financial commitment from other sources is of: 1 – very low value; 2 – low value; 3 – average value; 4 – high value; or 5 – very high value. (See below)

Reviewer 3A (Rating: 4)
The proposed budget seems to be of high value as the project might incur such expenditure. It is not clear about the value of the subcontractor portion of the budget.

Reviewer 3B (Rating: 4)
The proposed budget value seems high, but I have assumed there is IP on which to base the need for a pilot plant. I also would like to see industry cost share. Even thought there is 50% cost share, all of it comes from another public entity. How do we know industry is really serious – an industry cost share is critical. I believe there is some but the proposal does not describe it.

Reviewer 3C (Rating: 3)
- Overall – little detail given; difficult to judge.
- Task 1 - not clear exactly what will be tested and what improvements hope to be made.
- Task 2 Only a preliminary economic assessment is to be completed. Not clear what this means. Presumably a full detailed economic assessment will have to be done at a later date.
- Task 3 - Some designs were reportedly already made; not clear exactly what else remains to be done.

[1] "Value" – The value of the projected work and technical outcome for the budgeted amount of the project, based on your estimate of what the work might cost in research settings with which you are familiar.

10a. Financial commitment from other sources – A minimum of 50% of the total project must come from other sources to meet the program guidelines. Higher priority is to be given if the application has private industry investment equal to or at least 50% or more of total cost.

The minimum 50% cash match is demonstrated.

Reviewer 3A
There is no commitment of fund from the private sources, though they would participate in the project. There is a provision of $300,000.00 for UniField, but it is not known if there is any commitment from them. Moreover, 50% of the project grant is supposed to come from CBU, which is not yet guaranteed.

Section C. Overall Comments and Recommendations:

Please comment in a general way about the merits and flaws of the proposed project and make a recommendation whether or not to fund.

*Reviewer 3A **(Funding May Be Considered)***
The project seems to be viable utilization of North Dakota's feedstocks to produce liquid fuel. There is a tremendous potential for supply of feedstocks from the states farm. There is also great scope of building the pilot plant for the renewable oil refinery.

The proposed project is to receive matching grant of $500,000.00 from Center for Biomass Utilization, funding of which is not yet guaranteed, though the prospect is high. Moreover the budget information of $300,000.00 sought for its subcontractor UniField Engineering is not detailed.

Overall, the proposed project has prospect of completing in time and may be funded.

Reviewer 3B ***(Funding May Be Considered)***
The biggest flaws have already been noted and I have had to make certain assumptions that make me inclined to recommend funding. Those concerns include the absences of technology description, clarity about IP ownership, industry cost share and true partnership, and scientific hypotheses about why crambe is preferable to other ND oilseeds. There is no letter of support from Tesoro where the proposed pilot plant is to be built – are they really committed to the project and why is there no cost share (in-kind or otherwise)? Seemingly only public-sector funds are going into a very allied project focusing on supporting industry. Also, recognize that virgin vegetable oils are not cost competitive at the present time and mostly waste oils are currently used – crambe will probably be even less competitive than soybean oil; however, we do need to prepare for an improved economy and fuel shortages that could reverse the current situation.

Reviewer 3C ***(Funding May Be Considered)***

The project has merit in that the proposed pilot plant could have significant benefit for the state. Industrial partnerships appear strong. Development of this technology at a commercial scale is also important.

Unfortunately it was difficult to judge the proposal on all of its technical merits because the proposal outlined is lacking in detail. It appears as if the proposers are resting on their strong reputation and history in this field rather than *demonstrating* their knowledge, competence, and project plans in this proposal. If technical details were not expected in the proposal, the authors did a fine job explaining broadly what they wish to accomplish and how those accomplishments would benefit the state.

The EERC has a strong reputation and they likely do high-quality work. I am hesitant to recommend funding based (at least largely) on reputation. If this proposal had been submitted by a little-known organization, I would say that not enough details were provided to allow funding. Applications need to be judged by what is submitted in the documentation, rather than what could have been submitted had the proposers wished to. The importance of the project also needs to be considered and I do believe that the project itself has strong merit.